

CHAPTER 9
SUPERVISORY CONTROL IMPLEMENTATION

1. GENERAL. The programs described in Chapter 7 can be applied to existing or new systems. Most of these programs may be applied to several types of systems, but others may only be applicable to special types of systems. For example, the boiler monitoring and control program is only applicable to facilities with boiler plants. Due to the interactive nature of the programs, the inputs and/or outputs of one implemented program may provide inputs to other programs.
2. INSTRUMENTS AND INPUTS. Certain instruments and inputs can be common to an entire building or, in some cases, the entire UMCS. Electrical consumption and demand instrumentation do not need to be duplicated except in special cases, such as when a UMCS serves an extremely large geographical area, or multiple utility substations. When applications require OA measurement, the minimum requirement is one OA temperature and one RH instrument (when used) for each building. However, the designer may need to increase the minimum requirements to satisfy site specific building and system conditions. For example, separate OA instruments will be specified where intake temperatures of the OA measured on a roof mounted unit may vary significantly from other air intake locations, causing erroneous economizer calculations.
3. DIAGRAMS. Graphic diagrams of typical systems showing UMCS devices and functions for supervisory control implementation are provided in [Figures 9-1 through 9-31](#). Failure modes will be defined by the designer for each system's controlled devices in the event of a field equipment panel malfunction. Failure modes will be based on climate, type of system, and user requirements. The failure modes shown are for example purposes only. [Figures 9-19 through 9-31](#), which are not accompanied by corresponding database tables, are provided for illustrative purposes only.
4. TABLES. Database tables listing UMCS software and settings applied to typical systems are provided in [Tables 9-1 through 9-18](#). The designer will generate a separate database table for each system to be controlled or monitored by the UMCS. Two or more identical systems within the same building, having the same occupancy schedule, may be listed on the same database table. The table's contents will be tailored to the system being controlled for each specific application.
5. SYMBOLS AND ABBREVIATIONS. A listing of symbols and abbreviations used in the system schematics is provided in Appendix B.
6. ADDITIONAL APPLICATIONS. Additional utility systems monitoring and control applications which have been provided through UMCS, and which have proven beneficial in energy savings, demand savings, labor or other cost savings, are listed below. Each application listing includes typical monitored or controlled parameters. Additional applications will be evaluated for feasibility on individual UMCS projects.
 - a. Electric Networks (High and Low Tension).
 - (1) Metering of primary KV.
 - (2) Breaker status.
 - (3) Remote breaker control.
 - (4) Ground fault measurement and alarm
 - (5) Power factor measurement

- b. Stand-by Generators.
 - (1) Unit status.
 - (2) Scheduled exercising.
 - (3) Fuel storage tank levels.
 - (4) Generator voltage and load.
 - (5) Run-time monitoring.
- c. Power Plants.
 - (1) Status.
 - (2) Efficiency.
 - (3) Fuel storage.
 - (4) Tank level.
 - (5) Run-time monitoring.
- d. Uninterruptible Power Supplies.
 - (1) Status.
 - (2) Battery voltage and charging current.
 - (3) UPS output voltage and load.
- e. Exterior Lighting.
 - (1) Time scheduled control.
 - (2) Intensity reduction after “peak” hours.
- f. Interior Lighting.
 - (1) Time scheduled control.
- g. Transformer Substations.
 - (1) Status.
 - (2) Voltage and load.
 - (3) Transformer temperature.
- h. Switching Stations.
 - (1) Status.
 - (2) Breaker control.
- i. Frequency Converters.

- (1) Status.
 - (2) Voltage, frequency, and load.
 - (3) Run-time monitoring.
- j. Elevators.
 - (1) Machine room temperature alarm.
 - (2) Common alarm from control pane.
- k. Water Treatment Systems.
 - (1) Status.
 - (2) Hardness of water (ppm).
 - (3) Consumption.
- l. Sewer System.
 - (1) Flow/level in manholes and retention basins.
 - (2) Status and run-time of sewage lift pumps.
- m. Chlorination (Including Electrolytic) and Fluoridation Systems.
 - (1) Status.
 - (2) Chlorine and fluoride concentration (water analysis).
 - (3) Chlorine and fluoride tank levels.
 - (4) Water consumption.
- n. Booster Stations.
 - (1) Status.
 - (2) Alternating of pumps.
 - (3) Demand limiting of pumps.
 - (4) Pressure.
 - (5) Consumption.
- o. Water Pumping Stations.
 - (1) Status.
 - (2) Demand limiting of pump motors.
 - (3) Pressure.
 - (4) Consumption.

- p. Irrigation Systems.
 - (1) Scheduled operation based on rainfall (and, in some cases, residual moisture in the soil).
- q. Boiler Plants (Coal, Oil, and Gas).
 - (1) Energy consumption/heat generation.
 - (2) Fuel storage tank levels.
- r. District Heat Supply.
 - (1) Metering of demand/consumption.
 - (2) Night setback.
- s. Heating Distribution.
 - (1) Night setback.
 - (2) Leak detection for distribution piping.
- t. Domestic Hot Water Generators.
 - (1) Night setback.
- u. Cold Storage and Refrigeration Systems.
 - (1) Unit status/general alarms.
 - (2) Temperature.
 - (3) Demand limiting (compressor motors).
- v. Air Conditioners, including Window Air Conditioners.
 - (1) Time scheduled control.
 - (2) Demand limiting.
- w. High Pressure Steam Plants.
 - (1) Status.
 - (2) Fuel consumption/tank level.
 - (3) Steam pressure.
 - (4) Steam flow.
- x. Heat Pumps.
 - (1) Unit status.
 - (2) Time scheduled control.
 - (3) Night setback.

- (4) Demand limiting.
- y. Laundry Room Equipment (Electric Clothes Dryers).
 - (a) Demand limiting.
- z. Vending Machines.
 - (1) Demand limiting.
 - (2) Time-scheduled control of electrical power supply.
- aa. Saunas.
 - (1) Time scheduled control.
 - (2) Demand limiting.
- bb. Humidifiers.
 - (1) Status.
 - (2) Demand limiting of electric heating element.
- cc. Weather Stations.
 - (1) Relative humidity.
 - (2) Wind direction.
 - (3) Wind velocity.
 - (4) Cumulative rainfall.
 - (5) Heating degree days and cooling degree days calculation.
 - (6) Temperature.
- dd. Storage Tanks.
 - (1) Level alarm (high for waste, low for consumed liquid such as fuel).
 - (2) Leak detection.
 - (3) Scheduled waste removal.
- ee. Ground Water.
 - (1) Measurement of level and pH/value.
- ff. Medical Gas Systems (Oxygen, Vacuum, etc.).
 - (1) Status.
 - (2) Pressure.
 - (3) Operating hours of compressors, etc..

gg. Compressed Air Systems.

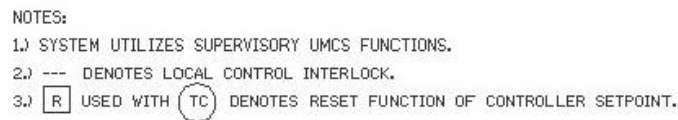
- (1) Status.
- (2) Pressure.
- (3) Operating hours of compressors, etc..
- (4) Demand limiting of compressor motors.

hh. Sewage Treatment Plans.

- (1) Status.
- (2) Operating hours of equipment.
- (3) Metering of treated sewage in CFM.
- (4) Measuring of chlorine and pH/values.

ii. Water Distribution.

- (1) Metering of consumption.
- (2) Leak detection.



9-7

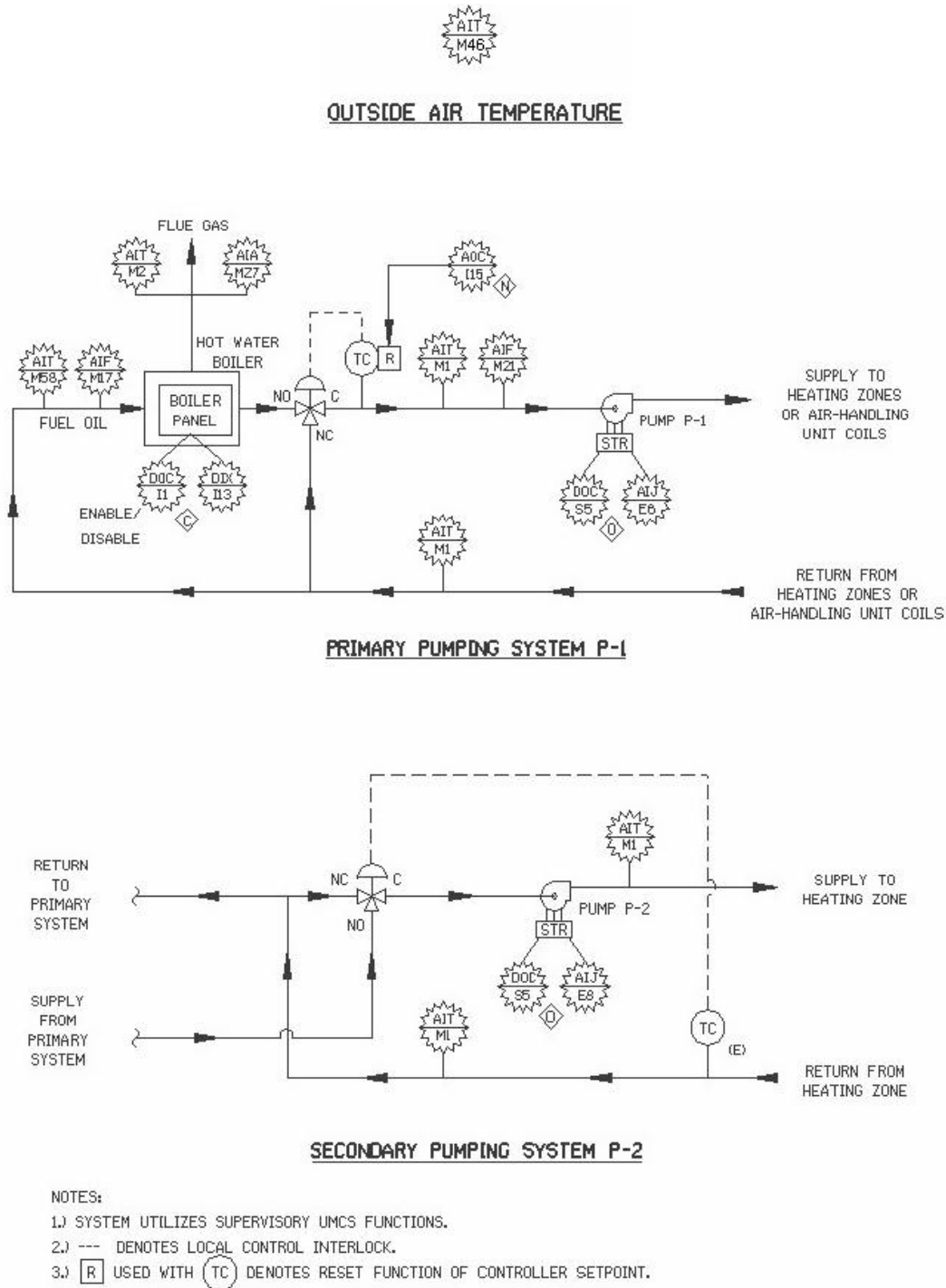
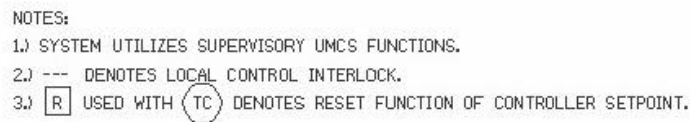
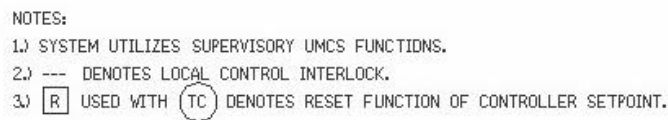


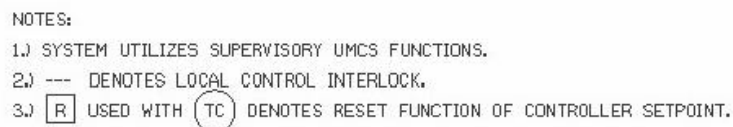
Figure 9-2. Hot Water Boiler and Primary/Secondary Heating System.



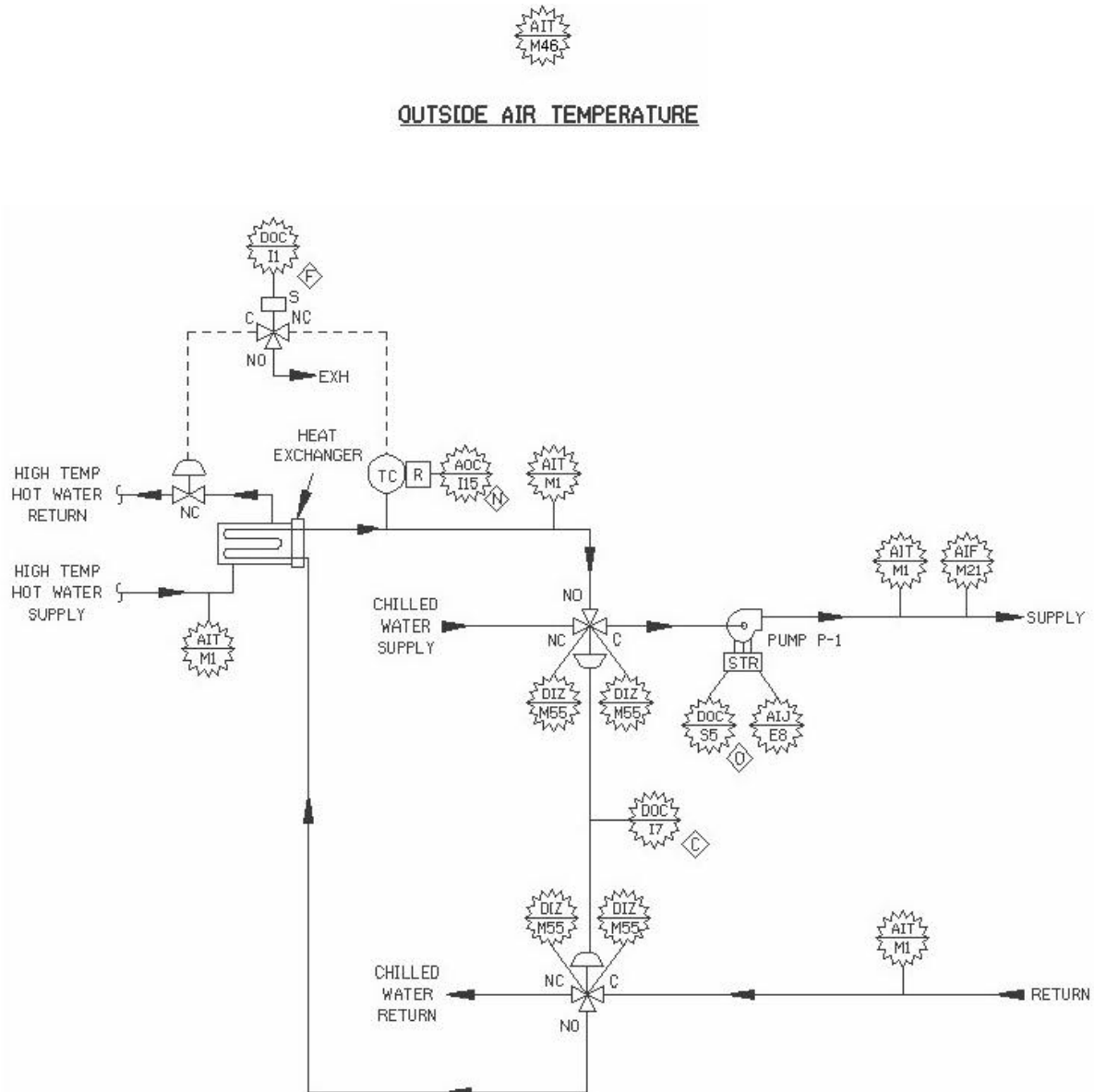
9-9



9-10

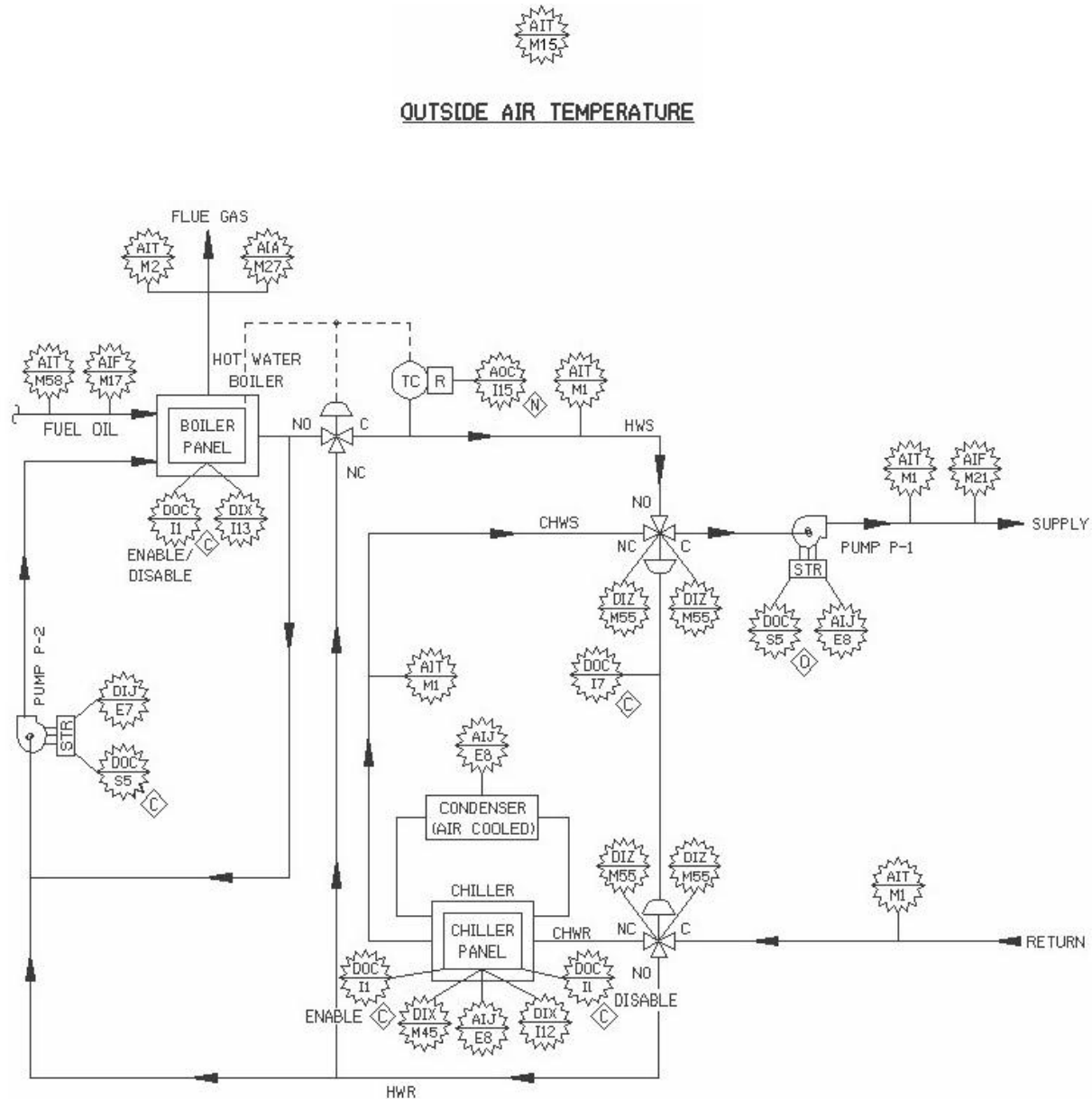


9-11



- NOTES:
- 1.) SYSTEM UTILIZES SUPERVISORY UMCS FUNCTIONS.
 - 2.) --- DENOTES LOCAL CONTROL INTERLOCK.
 - 3.) **R** USED WITH **TC** DENOTES RESET FUNCTION OF CONTROLLER SETPOINT.

Figure 9-6. High Temperature HW/HW Converter with Dual Temperature Distribution System.

**NOTES:**

- 1.) SYSTEM UTILIZES SUPERVISORY UMCS FUNCTIONS.
- 2.) --- DENOTES LOCAL CONTROL INTERLOCK.
- 3.) [R] USED WITH (TC) DENOTES RESET FUNCTION OF CONTROLLER SETPOINT.

Figure 9-7. Dual Temperature System with Constant Volume Hot Water Circulating Loop and Air-Cooled Chiller.



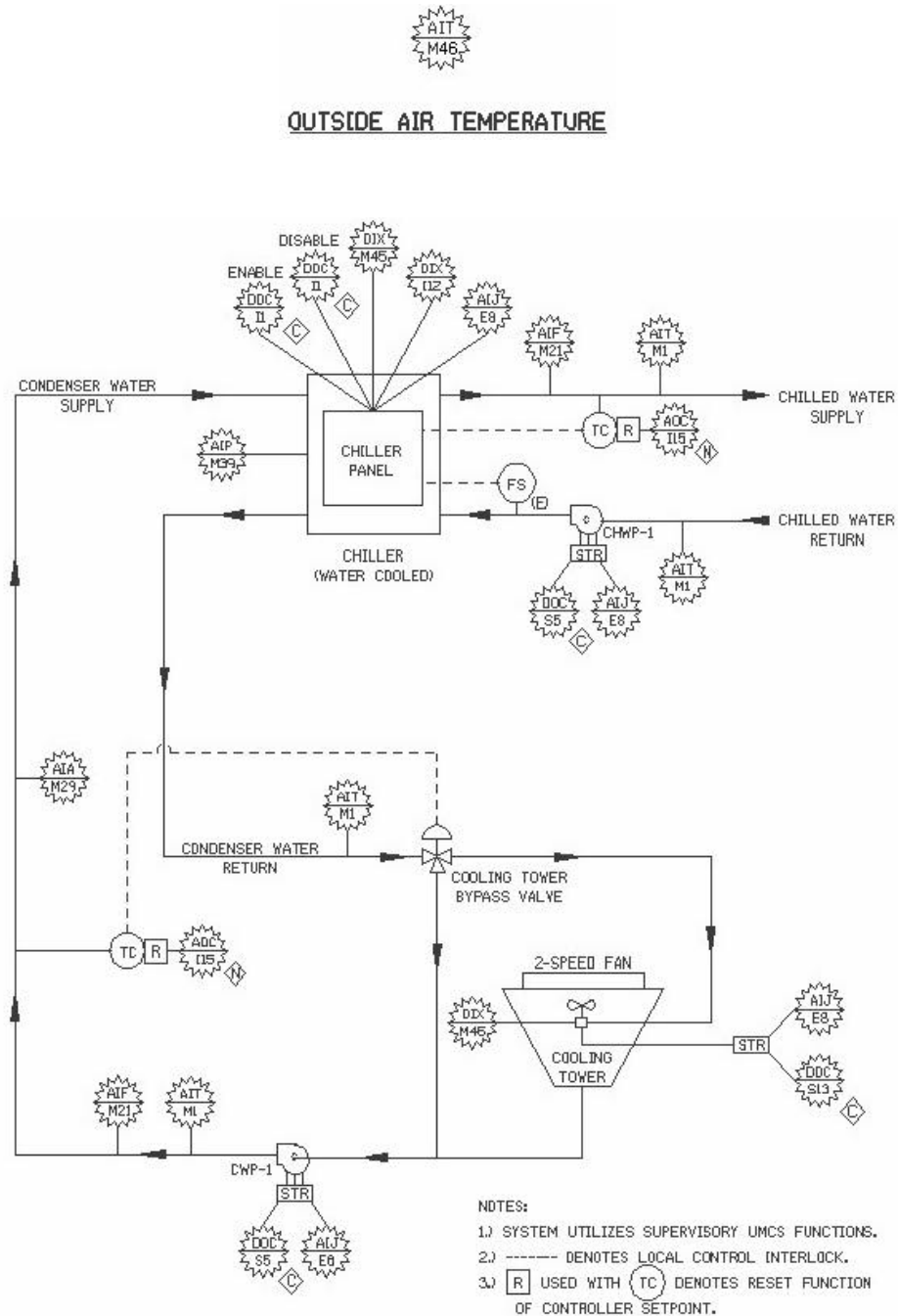


Figure 9-9. Water-Cooled Chiller.





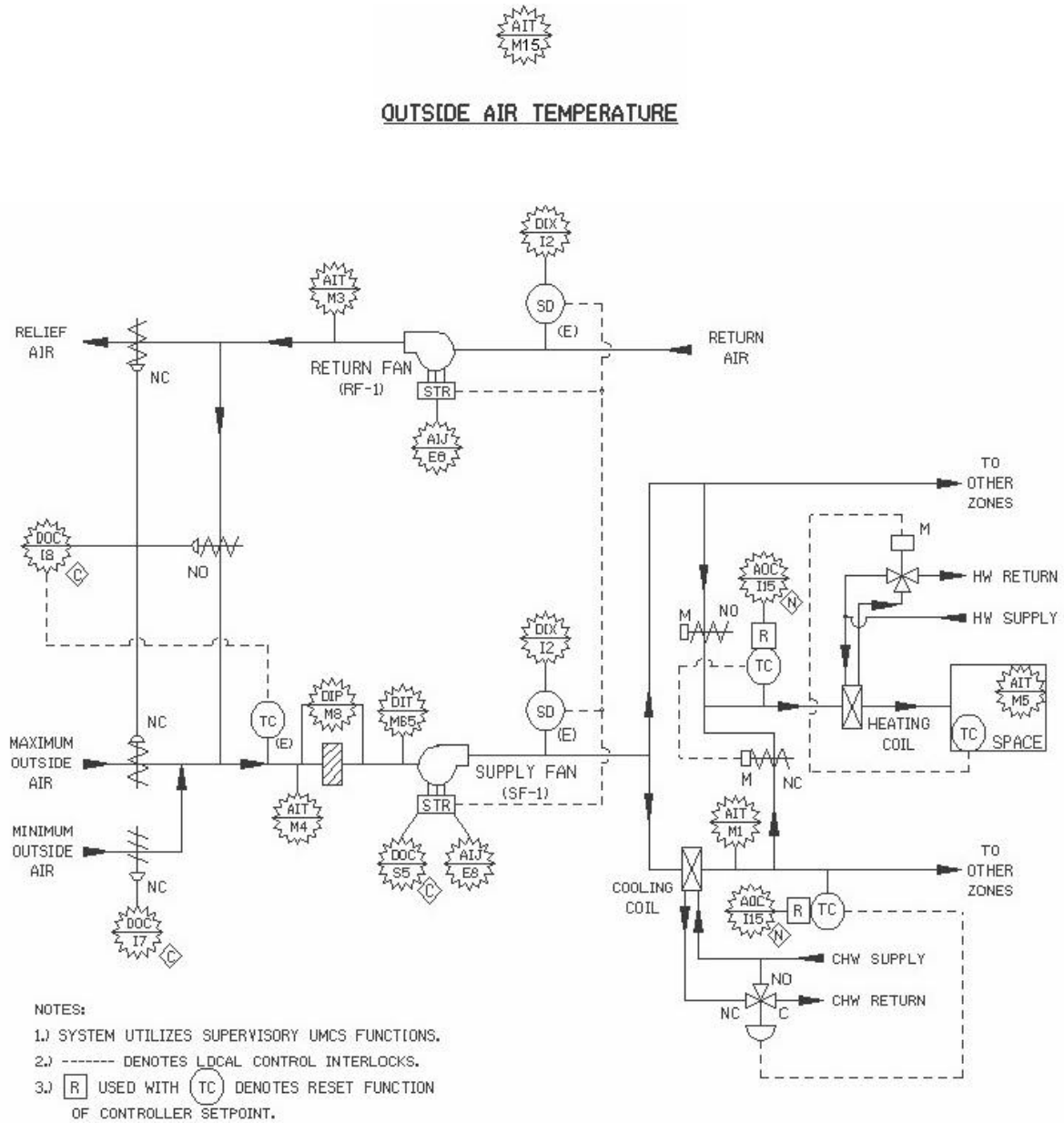


Figure 9-12. Bypass Multi-Zone Air Handling System with Hot Water and Chilled Water Coils.

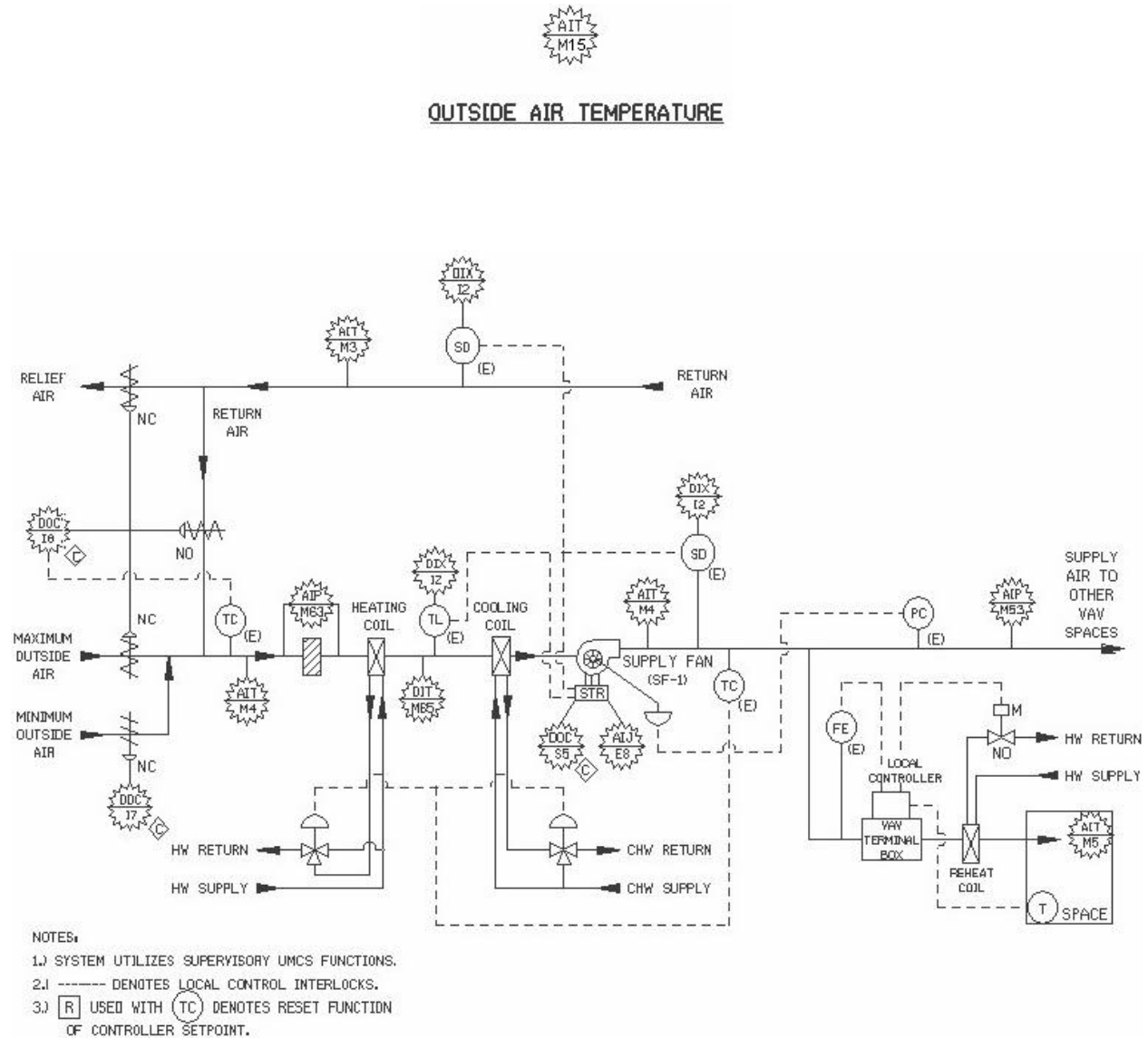


Figure 9-13. VAV Air Handling System with Hot Water and Chilled Water Coils.

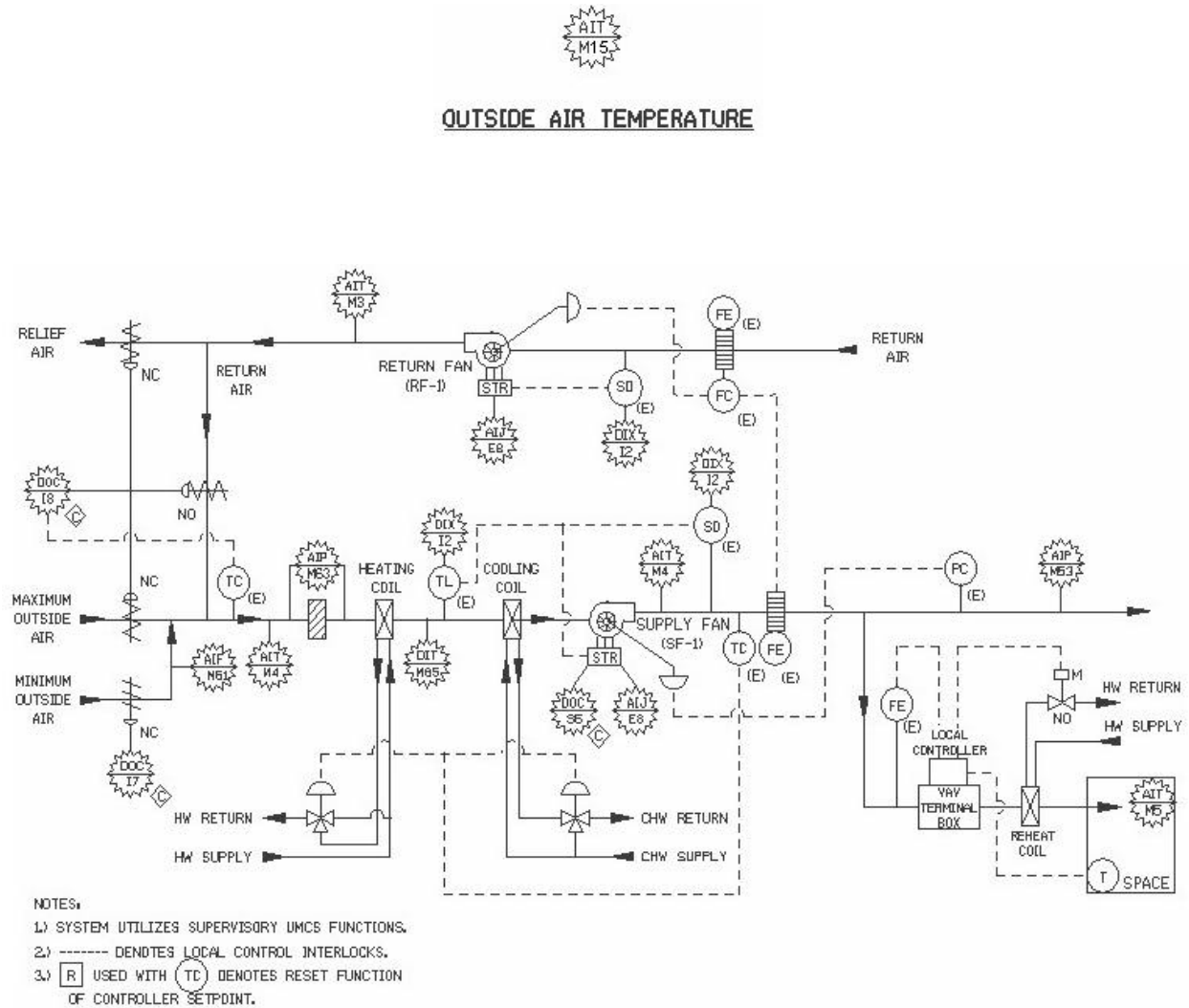


Figure 9-14. VAV Air Handling System with Return Air Fan and Hot Water/Chilled Water Coils.

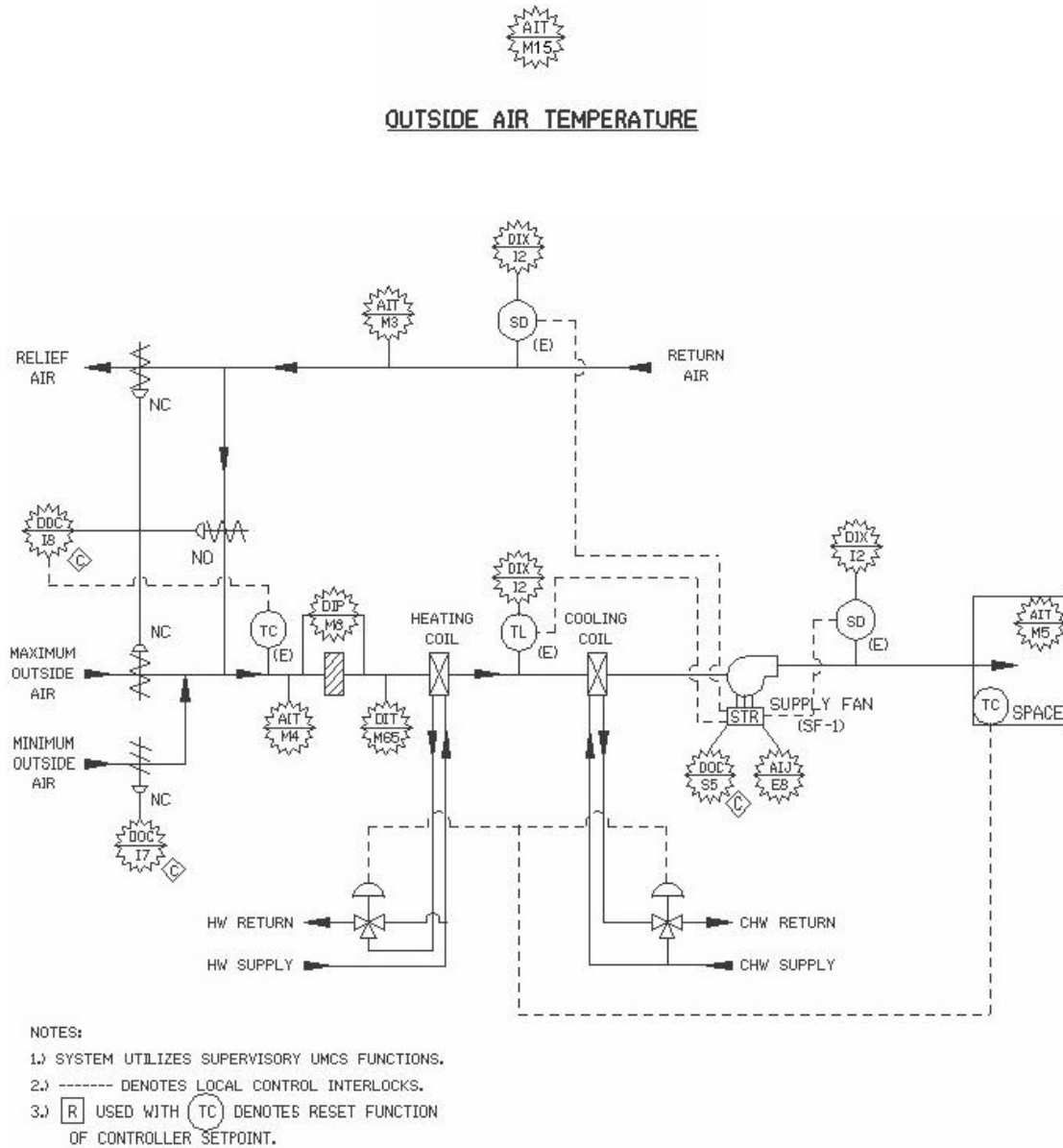


Figure 9-15. Single Zone Air Handling System with Hot Water and Chilled Water Coils.



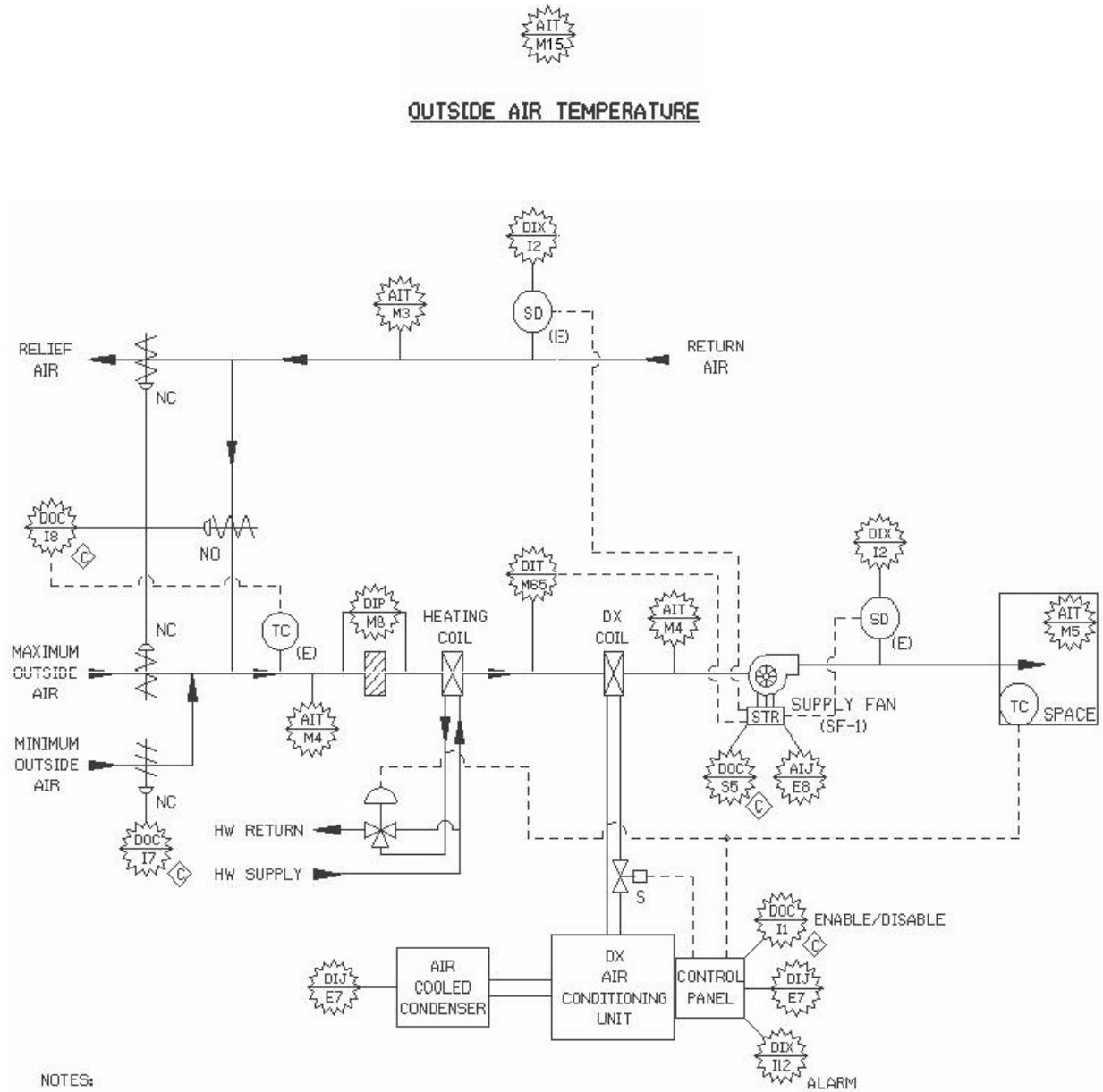
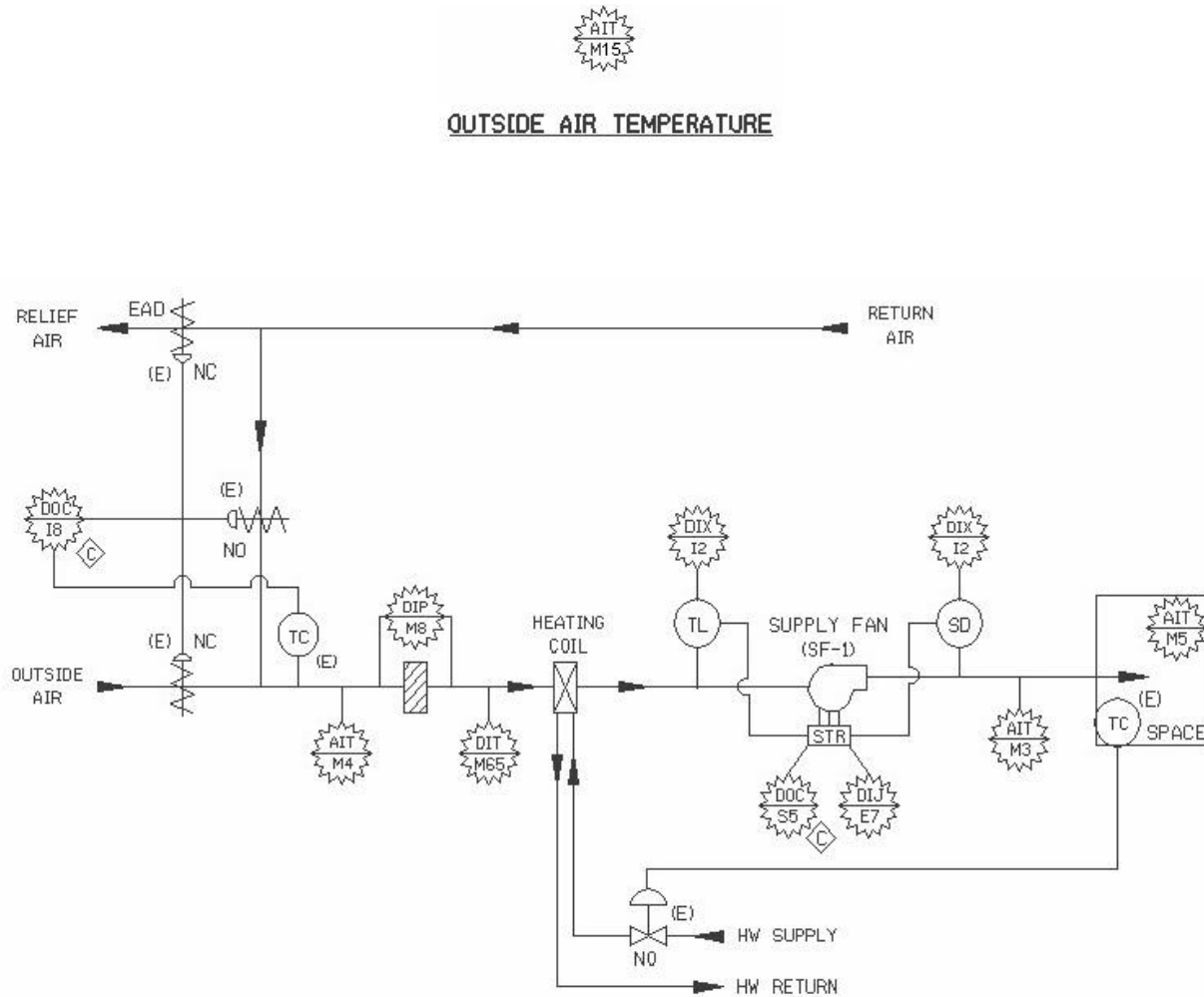


Figure 9-17. Single Zone Air Handling System with Hot Water and DX Refrigeration Coils.



NOTES:

- 1.) SYSTEM UTILIZES SUPERVISORY UMCS FUNCTIONS.
- 2.) --- DENOTES LOCAL CONTROL INTERLOCKS.

Figure 9-18. Heating and Ventilating System.

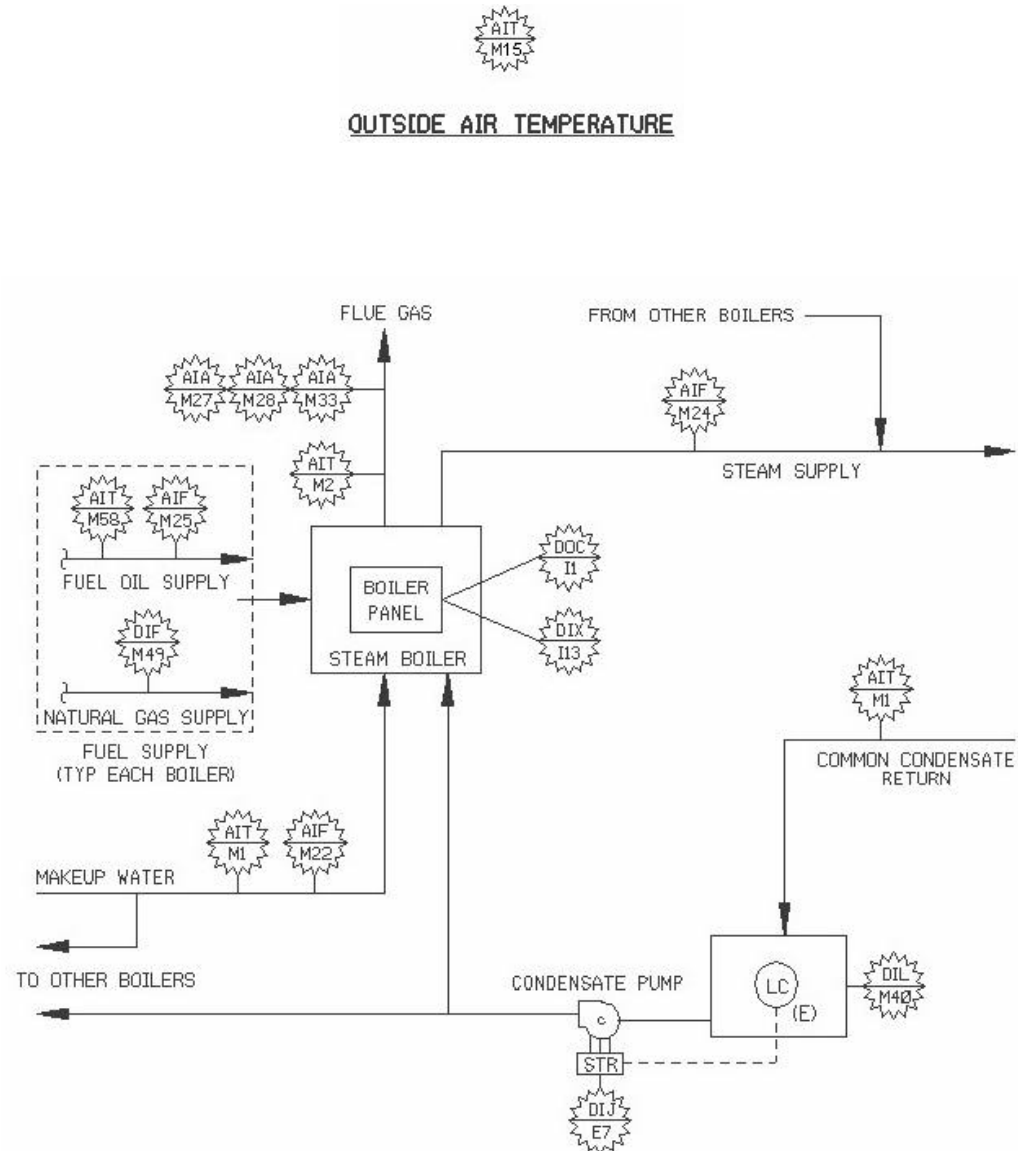


Figure 9-19. Steam Boilers.

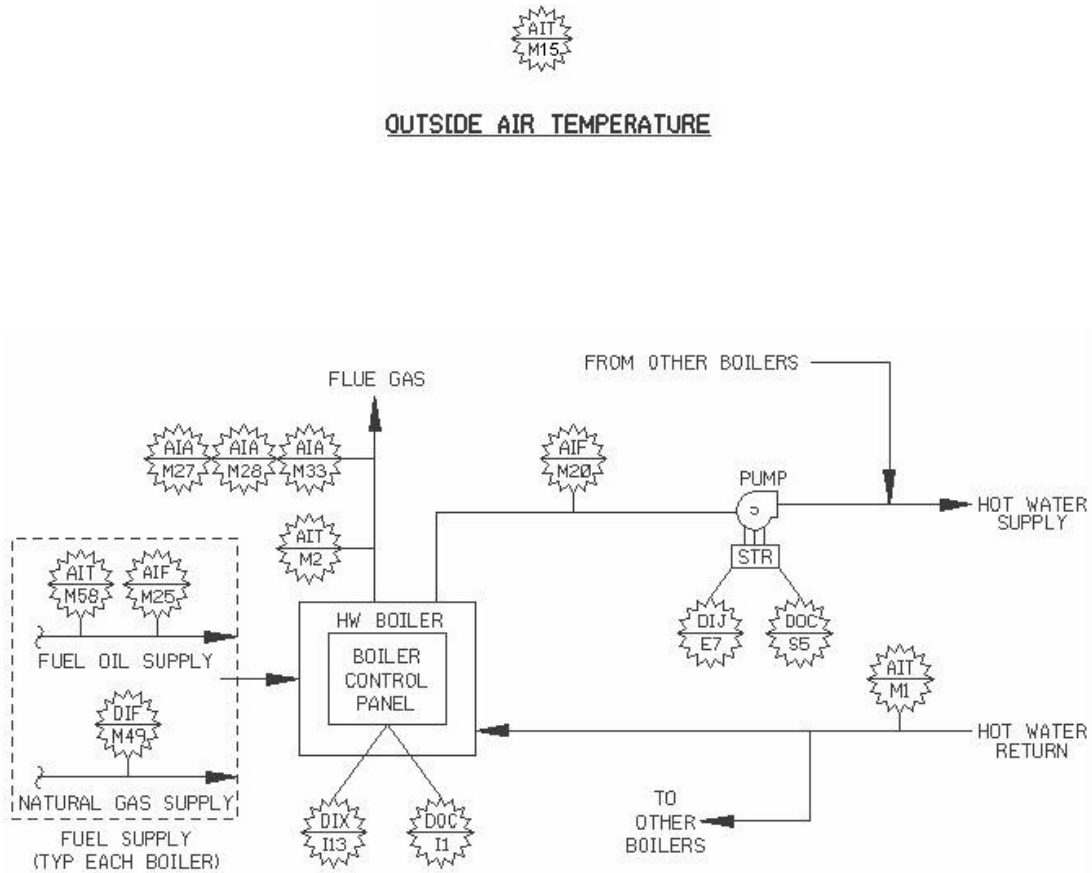


Figure 9-20. Hot Water Boilers.

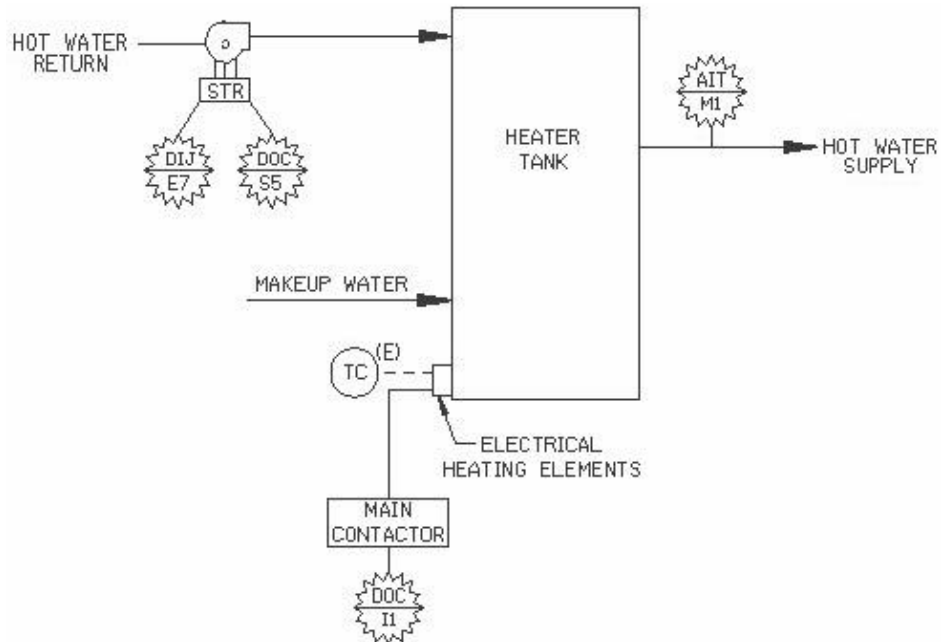


Figure 9-21. Electric Domestic Hot Water System.

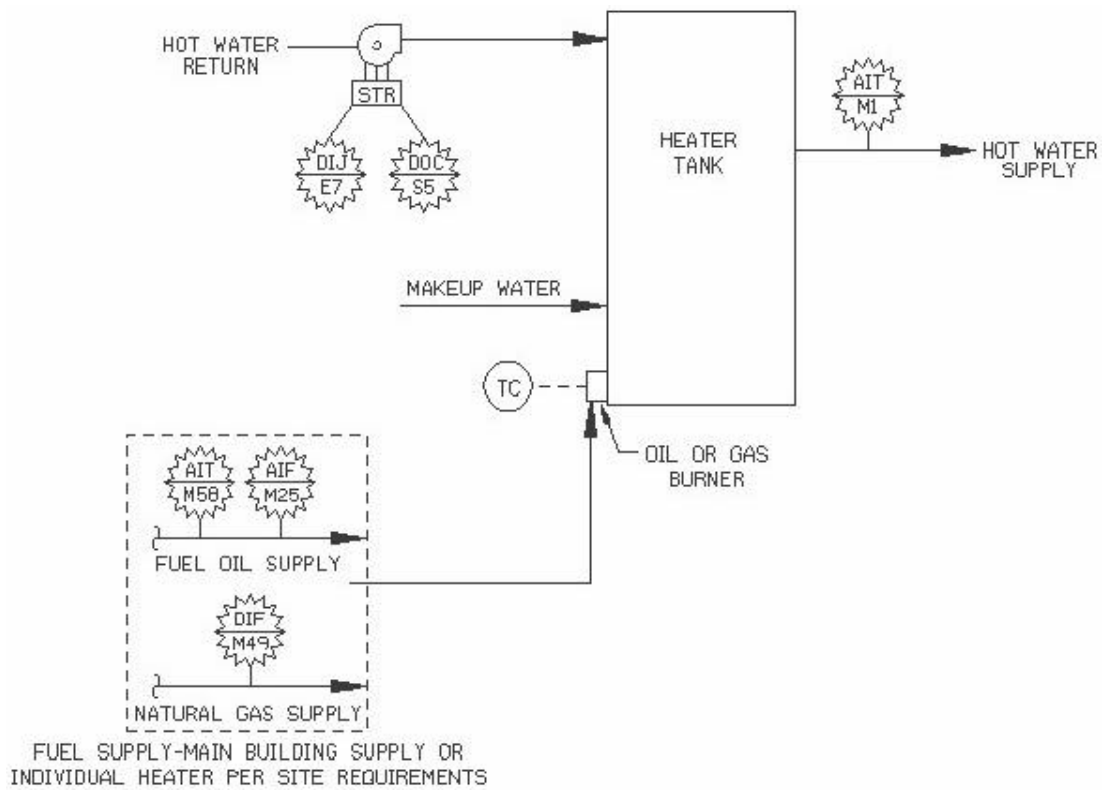


Figure 9-22. Oil/Gas Domestic Hot Water System.

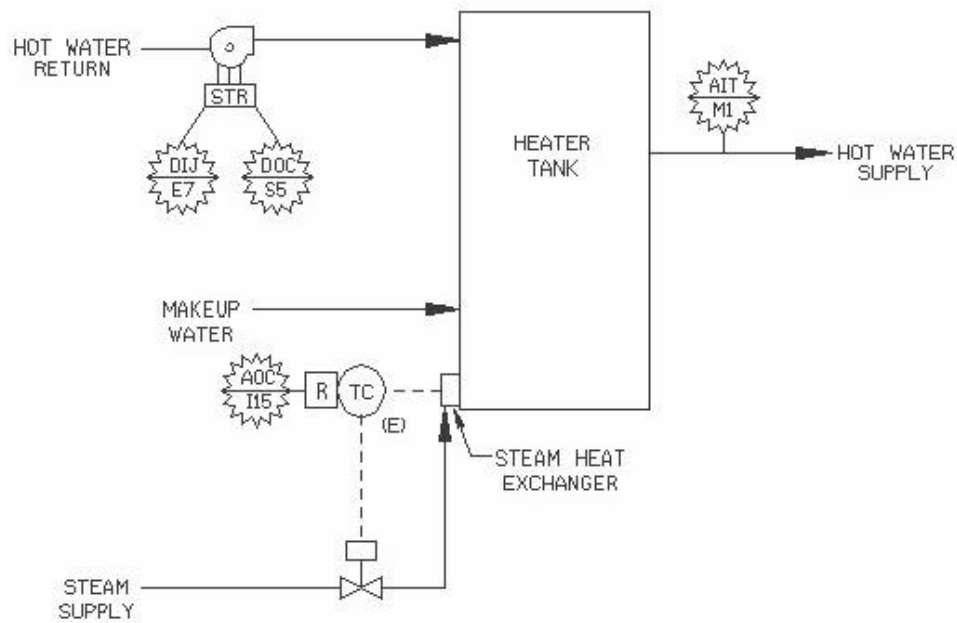


Figure 9-23. Steam Domestic Hot Water System.

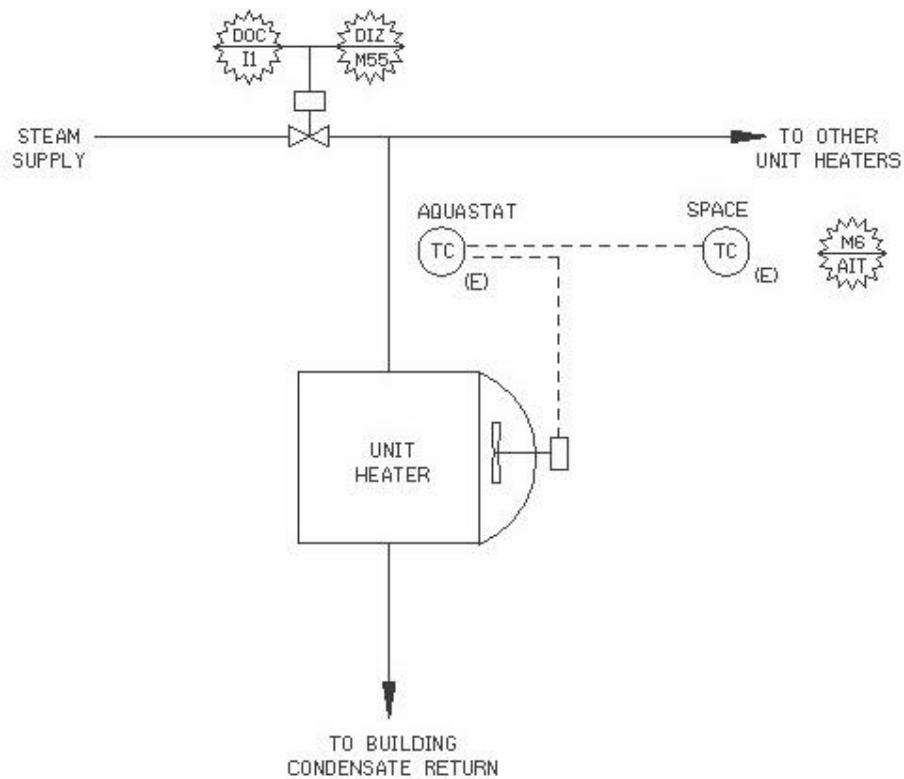


Figure 9-24. Steam Unit Heaters.

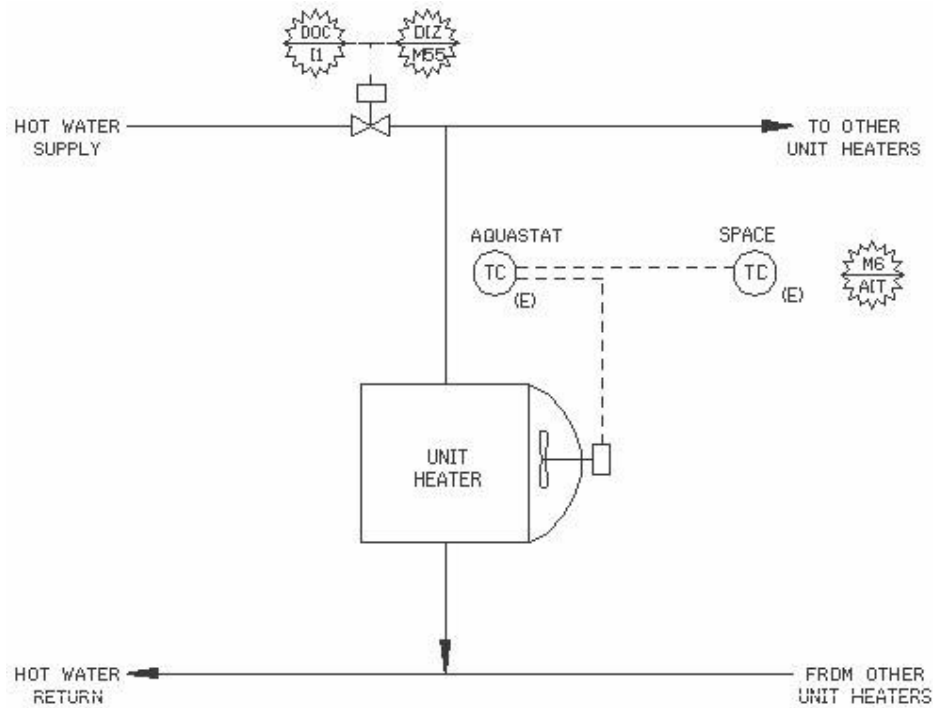


Figure 9-25. Hot Water Unit Heaters.

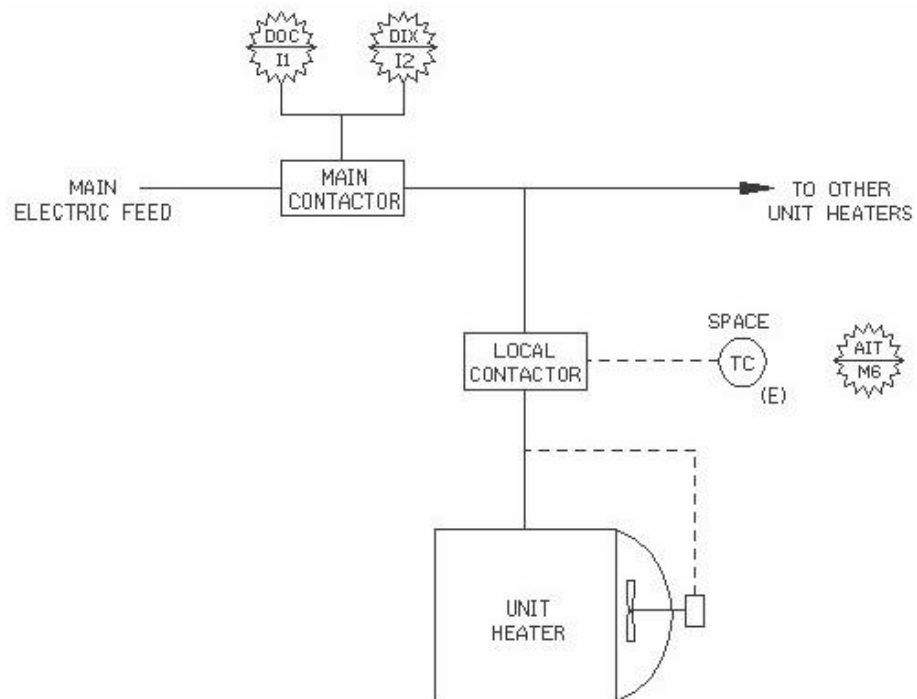


Figure 9-26. Electric Unit Heaters.

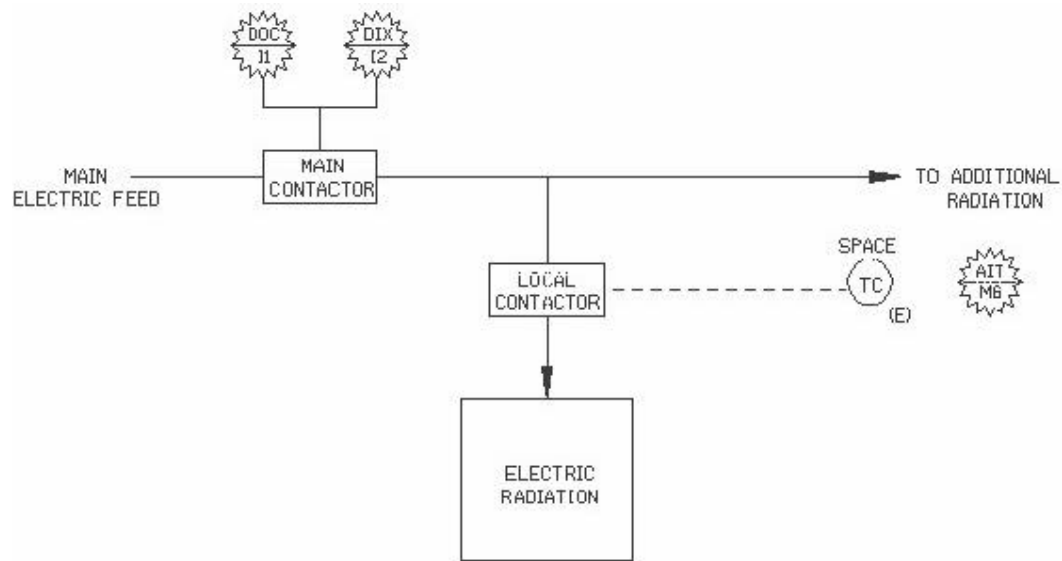


Figure 9-27. Electric Radiation.

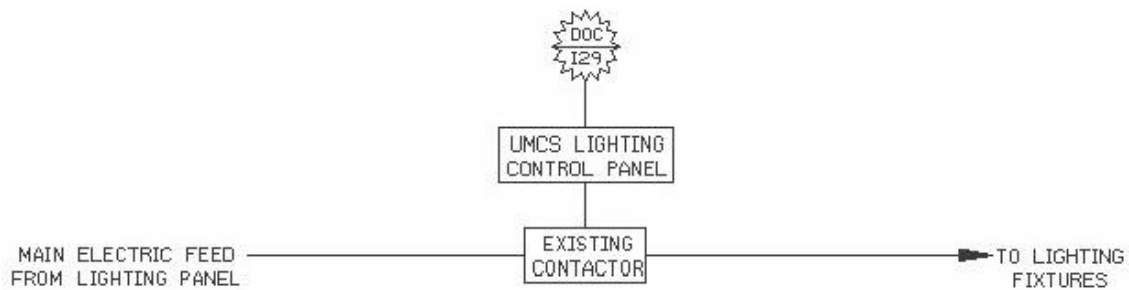


Figure 9-28. Lighting Control.

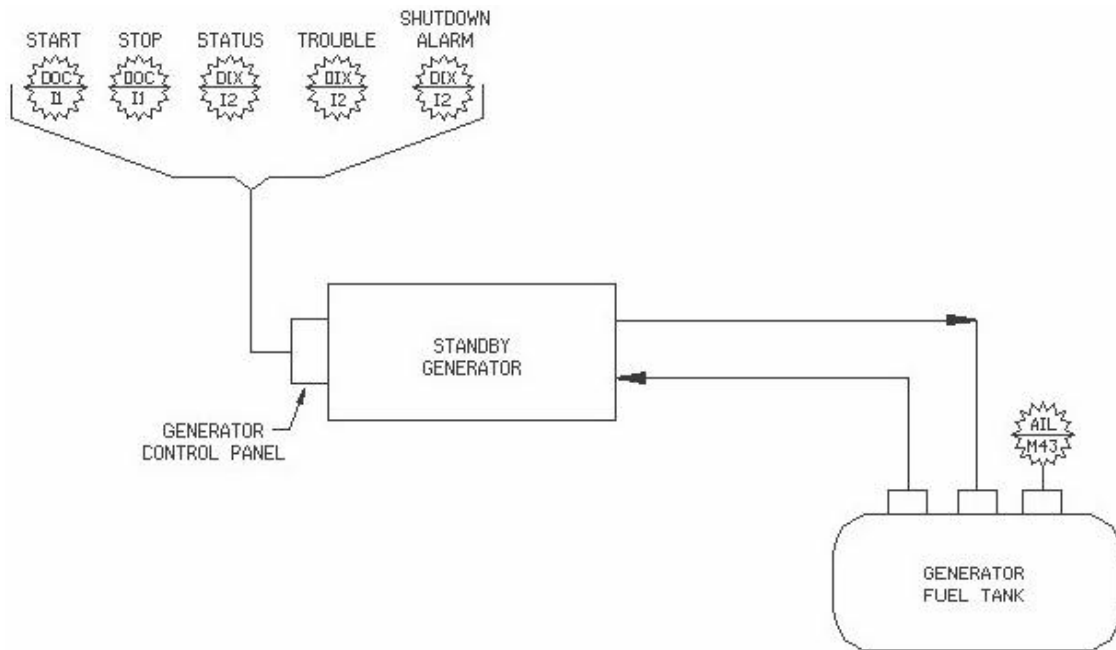


Figure 9-29. Standby Generator System.

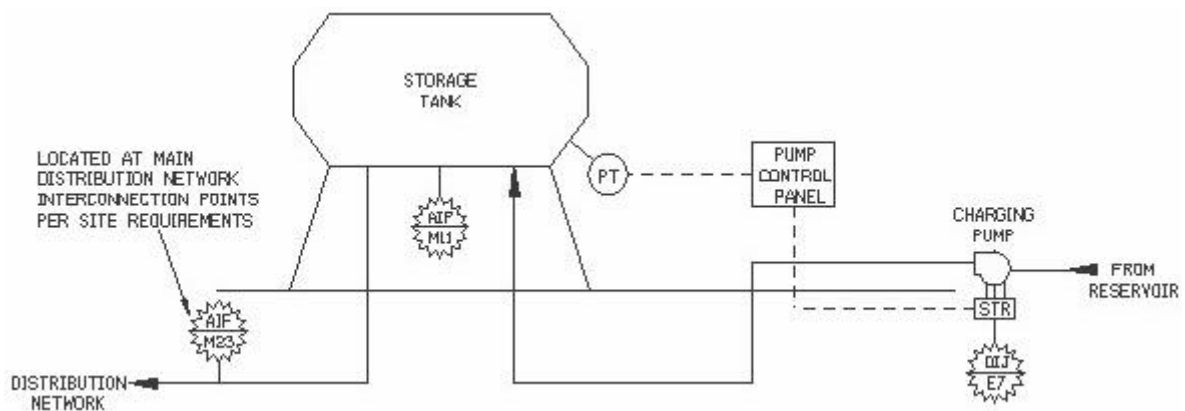


Figure 9-30. Water Storage and Distribution System.

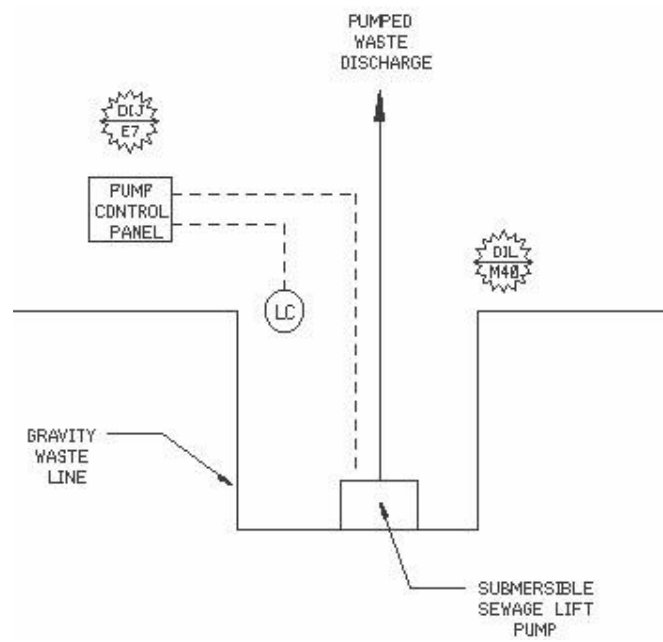


Figure 9-31. Sewage Lift System.

Table 9-2. Database Table for Hot Water Boiler and Primary/Secondary Heating System.

[illegible]

Table 9-3. Database Table for Hot Water Boiler with Constant Volume Circulating Loop and Primary/Secondary Heating System.

INSTALLATION: SITE NAME

AREA:

BLDG:

LOCATION:

ALARM DELAY ON STARTUP: XX

SYSTEM OPERATING PARAMETERS

PARAMETERS

	SUMMER				WINTER				DEMAND				SELECTED APPLICATION PROGRAMS						
	DEFAULT OCCUPIED SETPOINT	DEFAULT UNOCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT	DEFAULT OCCUPIED SETPOINT	DEFAULT UNOCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT	SCHEDULED START/STOP	OPTIMUM START/STOP	ECONOMIZER	VENTILATION/RECIRCULATION	HOT DECK/COLD DECK TEMPERATURE RESET	REHEAT COIL RESET	BOILER MONITORING & CONTROL	CHILLER SELECTION	CHILLED WATER TEMPERATURE RESET	CONDENSER WATER TEMPERATURE RESET	HOT WATER OA RESET
PRIMARY HW SUPPLY TEMP																			
PRIMARY HW RETURN TEMP																			
PRIMARY SYSTEM FLOW																			
SECONDARY HW SUPPLY TEMP																			
SECONDARY HW RETURN TEMP																			
FLUE GAS TEMP																			
FLUE GAS O2																			
FUEL FLOW																			
FUEL TEMP																			
REFER TO SEQUENCE OF OPERATIONS FOR ADDITIONAL SOFTWARE, SETTINGS AND OPERATIONAL REQUIREMENTS																			
DEMAND LIMITING																			
SUMMER STEP 1																			
SUMMER STEP 2																			
SUMMER STEP 3																			
WINTER STEP 1																			
WINTER STEP 2																			
ADDITIONAL SETTINGS																			

DAY OF WEEK/
HOLIDAY

OCCUPANCY SCHEDULE

WINTER

	OCCUPIED CYCLE 1		OCCUPIED CYCLE 2		OCCUPIED CYCLE 1		OCCUPIED CYCLE 2	
	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
SUNDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
MONDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
TUESDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
WEDNESDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
THURSDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
FRIDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
SATURDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC
HOLIDAY	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC	SITE SPECIFIC

EQUIPMENT NAME

CAPACITY

MOTOR HP

MANUFACTURER

MODEL/SERIES

PUMP P-1	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC
PUMP P-2	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC
PUMP P-3	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC
HW BOILER	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC	SYSTEM SPECIFIC

HW SUPPLY TEMP (DEG F)

OA TEMP (DEG F)

PRIMARY HW SUPPLY TEMP RESET SCHEDULE

SECONDARY

PUMP OFF

Table 9-5. Database Table for Steam HW/Converter with Dual Temperature Distribution System.

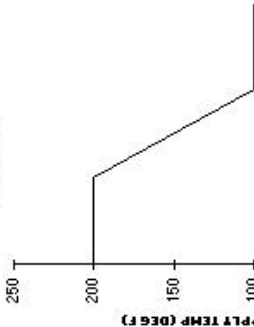
INSTALLATION: SITE NAME			AREA:	BLDG:	LOCATION:	ALARM DELAY ON STARTUP: XX				
PARAMETERS			SYSTEM OPERATING PARAMETERS							
			COOLING		HEATING		SELECTED APPLICATION PROGRAMS			
			DEFAULT OCCUPIED SETPOINT	DEFAULT UNOCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT	DEMAND LIMIT SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT	SCHEDULED START/STOP OPTIMUM START/STOP ECONOMIZER
HW SUPPLY TEMP			SEE RESET SCH.	SEE RESET SCH.	SP + 4.5 DEG. F			SP + 5.0 DEG. F		VENTILATION/RECIRCULATION HOT DECK/COLD DECK TEMPERATURE RESET REHEAT COIL RESET BOILER MONITORING & CONTROL CHILLER SELECTION
SUPPLY TEMP					XX DEG. F			XX DEG. F		CHILLED WATER TEMPERATURE RESET CONDENSER WATER TEMPERATURE RESET HOT WATER OA RESET
RETURN TEMP					XX DEG. F			XX DEG. F		
SYSTEM FLOW					XX GPM (LOW)			XX GPM (LOW)		
STEAM PRESSURE					XX PSI			XX PSI		
							REFER TO SEQUENCE OF OPERATIONS FOR ADDITIONAL SOFTWARE, SETTING AND OPERATIONAL REQUIREMENTS			
							DEMAND LIMITING			
							SUMMER STEP 1			
							SUMMER STEP 2			
							SUMMER STEP 3			
							WINTER STEP 1			
							WINTER STEP 2			
							ADDITIONAL SETTINGS			
							PRIMARY SUPPLY TEMP RESET SCHEDULE			
										

Table 9-6. Database Table for High Temperature HW/HW Converter with Dual Temperature Distribution System.

[illegible]

Table 9-7. Database Table For Dual Temperature System with
Constant Volume Hot Water Circulating Loop And Air-Cooled Chiller.

INSTALLATION: SITE NAME			AREA:	BLDG:	LOCATION:	ALARM DELAY ON STARTUP: XX				SYSTEM OPERATING PARAMETERS				HEATING				SELECTED APPLICATION PROGRAMS			
PARAMETERS			DEFAULT OCCUPIED SETPOINT	DEFAULT UNOCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT	DEFAULT OCCUPIED SETPOINT	DEFAULT UNOCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT											
HW SUPPLY TEMP			SEE RESET SCH.		SP +/- 5 DEG. F		SEE RESET SCH.		SP +/- 5 DEG. F								SCHEDULED START/STOP				
SUPPLY TEMP					XX DEG. F				XX DEG. F								OPTIMUM START/STOP				
RETURN TEMP					XX DEG. F				XX DEG. F								ECONOMIZER				
SYSTEM FLOW					XX GPM (LOW)				XX GPM (LOW)								VENTILATION/RECIRCULATION				
FLUE GAS TEMP					XX DEG. F				XX DEG. F								HOT DECK/COLD DECK TEMPERATURE RESET				
FLUE GAS O2					XX % O2				XX % O2								REHEAT COIL RESET				
FUEL FLOW					XX GPM				XX GPM (LOW)								BOILER MONITORING & CONTROL				
FUEL TEMP					XX DEG. F				XX DEG. F								CHILLER SELECTION				
																	CHILLED WATER TEMPERATURE RESET				
																	CONDENSER WATER TEMPERATURE RESET				
																	HOT WATER OA RESET				

Table 9-8. Database Table for Dual Temperature System with Hot Water Boiler and Air Cooled Chiller

INSTALLATION: SITE NAME

AREA:

BLDG:

LOCATION:

ALARM DELAY ON STARTUP: 22

PARAMETERS

COOLING

HEATING

DEMAND LIMIT

DEMAND LIMIT

DEFAULT SETPOINT

UNOCCUPIED SETPOINT

ALARM LIMIT

DEMAND SETPOINT

DEFAULT SETPOINT

UNOCCUPIED SETPOINT

ALARM LIMIT

DEMAND SETPOINT

SEE RESET SCH.

SP +1-5DEG. F

SEE RESET SCH.

SEE RESET SCH.

SEE RESET SCH.

SP +1-5DEG. F

SEE RESET SCH.

SEE RESET SCH.

SUPPLY TEMP

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

RETURN TEMP

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

SYSTEM FLOW

33 GPM (LOW)

33 GPM (LOW)

33 GPM (LOW)

33 GPM (LOW)

33 GPM (LOW)

33 GPM (LOW)

33 GPM (LOW)

FLUE GAS TEMP

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

FLUE GAS O2

33 % O2

33 % O2

33 % O2

33 % O2

33 % O2

33 % O2

33 % O2

FUEL FLOW

33 GPM

33 GPM

33 GPM

33 GPM

33 GPM

33 GPM

33 GPM

FUEL TEMP

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

33 DEG. F

DEMAND LIMITING

SUMMER STEP 1

SUMMER STEP 2

SUMMER STEP 3

WINTER STEP 1

WINTER STEP 2

REFER TO SEQUENCE OF OPERATIONS FOR
ADDITIONAL SOFTWARE, SETTINGS AND
OPERATIONAL REQUIREMENTS

ADDITIONAL SETTINGS

SELECTED APPLICATION PROGRAMS

SCHEDULED START/STOP

OPTIMUM START/STOP

ECONOMIZER

VENTILATION/RECIRCULATION

HOT DECK/COLD DECK TEMPERATURE RESET

REHEAT COIL RESET

BOILER MONITORING & CONTROL

CHILLER SELECTION

CHILLED WATER TEMPERATURE RESET

CONDENSER WATER TEMPERATURE RESET

HOT WATER OA RESET

HW SUPPLY TEMP (DEG. F)

250

200

150

100

50

0

-20

0

60

80

OA TEMP (DEG. F)

DAY OF WEEK/
HOLIDAY

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

HOLIDAY

OCCUPIED PERIOD 1

OCCUPIED PERIOD 2

OCCUPIED PERIOD 3

OCCUPIED PERIOD 4

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

SITE SPECIFIC

EQUIPMENT NAME

PUMP P-1

HW BOILER

CHILLER

CAPACITY

SYSTEM SPECIFIC

SYSTEM SPECIFIC

SYSTEM SPECIFIC

MOTOR HP

SYSTEM SPECIFIC

SYSTEM SPECIFIC

SYSTEM SPECIFIC

MANUFACTURER

SYSTEM SPECIFIC

SYSTEM SPECIFIC

SYSTEM SPECIFIC

MODEL/SERIES

SYSTEM SPECIFIC

SYSTEM SPECIFIC

SYSTEM SPECIFIC

[illegible]

Table 9-10. Database Table For Multi-Zone Air Handling System w/Hot Water and Chilled Water Coils.

[illegible]

9-43

INSTALLATION: SITE NAME

AREA:

BLDG:

LOCATION:

ALARM DELAY ON STARTUP: XX

SYSTEM OPERATING PARAMETERS

COOLING

HEATING

PARAMETERS

DEMAND LIMIT SETPOINT

ALARM LIMIT SETTINGS

DEFAULT UNOCCUPIED SETPOINT

DEFAULT OCCUPIED SETPOINT

PER SEQUENCE

PER RESET SCH.

PER RESET SCH.

XX DEG. F

XX* WC

XX DEG. F

XX DEG. F

XX DEG. F

XX* WC

XX DEG. F

XX DEG. F

XX* WC

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

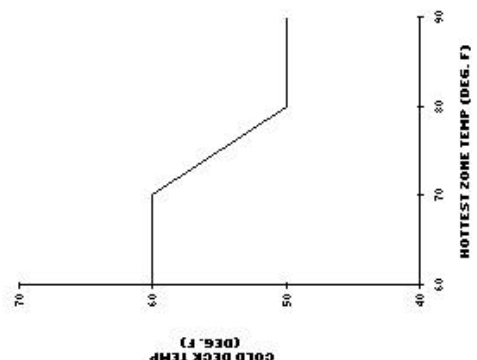
XX DEG. F

XX DEG. F

XX DEG. F

XX DEG. F

Table 9-12. Database Table For Bypass Multi-Zone Air Handling
System with Hot Water and Chilled Water Coils

INSTALLATION: SITE NAME			AREA:		BLDG:		LOCATION:		ALARM DELAY ON STARTUP: XX			
PARAMETERS			SYSTEM OPERATING PARAMETERS				SELECTED APPLICATION PROGRAMS					
			COOLING		HEATING							
			DEFAULT OCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT	DEFAULT UNOCCUPIED SETPOINT	ALARM LIMIT SETTINGS	DEMAND LIMIT SETPOINT				
MIXED AIR TEMP			PER SEQUENCE	SP (+/-) 2 DEG. F	PER SEQUENCE	SP (+/-) 2 DEG. F	SP (+/-) 2 DEG. F	SP (+/-) 2 DEG. F				
COLD DECK TEMP			PER RESET SCH	SP (+/-) 2 DEG. F	PER RESET SCH	SP (+/-) 2 DEG. F	SP (+/-) 2 DEG. F	SP (+/-) 2 DEG. F				
ZONE SPACE TEMP				XX DEG. F	XX DEG. F		XX DEG. F	XX DEG. F				
FILTER				XX° W.C.			XX° W.C.					
LOW TEMP DEVICE				XX DEG. F			XX DEG. F					
REFER TO SEQUENCE OF OPERATIONS FOR ADDITIONAL SOFTWARE, SETTING AND OPERATIONAL REQUIREMENTS												
DEMAND LIMITING												
SUMMER STEP 1												
SUMMER STEP 2												
SUMMER STEP 3												
WINTER STEP 1												
WINTER STEP 2												
ADDITIONAL SETTINGS												
COLD DECK TEMP RESET SCHEDULE												
												

9-47

[illegible]

9-49

[illegible]

Table 9-18. Database Table Heating And Ventilating System.

[illegible]